



Full wwPDB X-ray Structure Validation Report ⓘ

May 18, 2020 – 08:53 pm BST

PDB ID : 2BFX
Title : Mechanism of Aurora-B activation by INCENP and inhibition by Hesperadin.
Authors : Sessa, F.; Mapelli, M.; Ciferri, C.; Tarricone, C.; Areces, L.B.; Schneider, T.R.;
Stukenberg, P.T.; Musacchio, A.
Deposited on : 2004-12-15
Resolution : 1.80 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

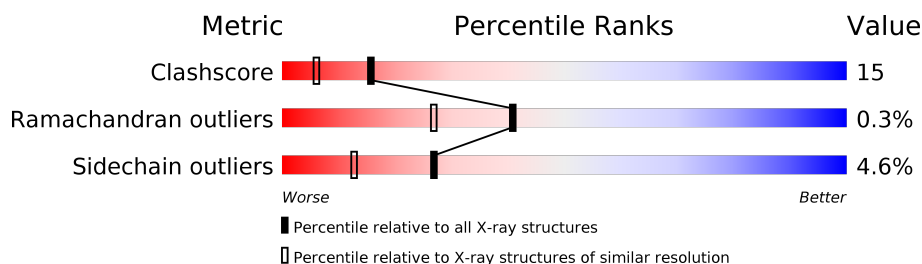
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	284	
1	B	284	
2	C	43	
2	D	43	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5496 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called AURORA KINASE B-A.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	271	Total	C	N	O	P	S	0	0	1
			2253	1444	407	388	1	13			
1	B	277	Total	C	N	O	P	S	0	0	1
			2296	1469	414	398	1	14			

- Molecule 2 is a protein called INNER CENTROMERE PROTEIN A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	41	Total	C	N	O	S	0	0	1
			328	212	54	61	1			
2	D	43	Total	C	N	O	S	0	0	0
			351	225	58	67	1			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	120	Total	O	0	0
			120	120		
3	B	131	Total	O	0	0
			131	131		
3	C	13	Total	O	0	0
			13	13		
3	D	4	Total	O	0	0
			4	4		

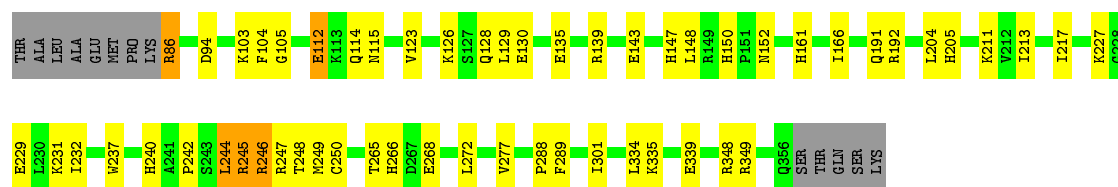
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

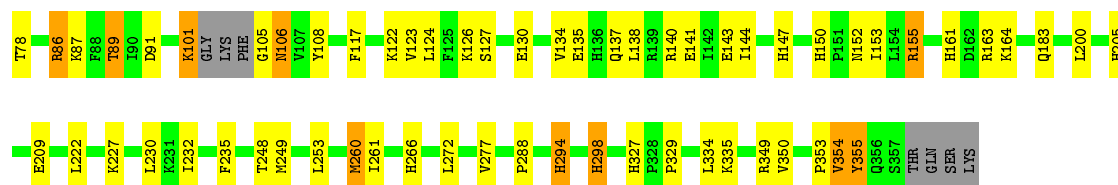
• Molecule 1: AURORA KINASE B-A

Chain A: 



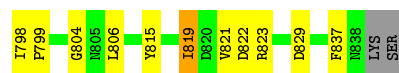
• Molecule 1: AURORA KINASE B-A

Chain B: 



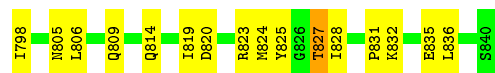
• Molecule 2: INNER CENTROMERE PROTEIN A

Chain C: 



• Molecule 2: INNER CENTROMERE PROTEIN A

Chain D: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	45.94 Å 66.90 Å 116.52 Å 90.00° 96.79° 90.00°	Depositor
Resolution (Å)	19.92 – 1.80	Depositor
% Data completeness (in resolution range)	99.2 (19.92-1.80)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.197 , 0.226	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5496	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: TPO

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.74	0/2303	0.88	2/3099 (0.1%)
1	B	0.80	0/2345	0.89	1/3156 (0.0%)
2	C	0.66	0/336	0.82	0/457
2	D	0.64	0/359	0.71	0/485
All	All	0.75	0/5343	0.87	3/7197 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	101	LYS	N-CA-C	6.75	129.21	111.00
1	A	246	ARG	NE-CZ-NH2	-5.87	117.37	120.30
1	A	247	ARG	CG-CD-NE	-5.31	100.64	111.80

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2253	0	2258	60	0
1	B	2296	0	2304	79	0
2	C	328	0	323	7	0
2	D	351	0	347	14	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	120	0	0	3	0
3	B	131	0	0	6	0
3	C	13	0	0	2	0
3	D	4	0	0	0	0
All	All	5496	0	5232	153	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 15.

All (153) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:248:TPO:C	1:A:249:MET:N	2.00	1.24
1:A:245:ARG:HH11	1:A:245:ARG:HB3	1.09	1.11
1:B:253:LEU:HD22	1:B:294:HIS:CE1	1.93	1.02
1:A:211:LYS:HD3	1:A:242:PRO:HA	1.47	0.96
1:A:245:ARG:NH1	1:A:245:ARG:HB3	1.82	0.94
1:B:260:MET:HA	1:B:260:MET:HE2	1.50	0.92
1:B:140:ARG:O	1:B:144:ILE:HD13	1.74	0.87
1:B:150:HIS:HD2	1:B:152:ASN:H	1.24	0.85
1:A:150:HIS:HD2	1:A:152:ASN:H	1.22	0.83
1:A:289:PHE:CD1	1:A:301:ILE:HD13	2.13	0.82
1:A:245:ARG:HH12	1:A:266:HIS:N	1.77	0.82
1:A:245:ARG:CB	1:A:245:ARG:HH11	1.92	0.82
1:B:253:LEU:HD22	1:B:294:HIS:NE2	1.96	0.79
1:B:124:LEU:HD12	1:B:124:LEU:N	1.97	0.78
1:B:155:ARG:HH11	1:B:155:ARG:CG	1.95	0.78
1:A:161:HIS:HB3	1:A:166:ILE:HD13	1.66	0.77
1:B:155:ARG:HH11	1:B:155:ARG:HG3	1.47	0.77
1:A:240:HIS:CE1	1:A:242:PRO:HG3	2.19	0.77
1:A:248:TPO:C	1:A:249:MET:CA	2.61	0.77
1:A:150:HIS:CD2	1:A:152:ASN:H	2.02	0.77
2:D:805:ASN:O	2:D:809:GLN:HG3	1.86	0.75
1:A:152:ASN:O	1:A:232:ILE:HD12	1.86	0.74
1:B:87:LYS:HE3	3:C:2012:HOH:O	1.87	0.73
1:B:137:GLN:O	1:B:141:GLU:HG3	1.87	0.73
1:B:126:LYS:NZ	1:B:161:HIS:HD2	1.87	0.72
1:B:153:ILE:HD13	1:B:232:ILE:HB	1.71	0.72
1:B:150:HIS:CD2	1:B:152:ASN:H	2.06	0.72
2:D:823:ARG:O	2:D:827:THR:HB	1.90	0.71
1:B:101:LYS:C	1:B:105:GLY:O	2.28	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:248:TPO:C	1:B:249:MET:CA	2.69	0.70
1:A:112:GLU:HG2	2:D:825:TYR:OH	1.92	0.70
1:B:135:GLU:HG3	2:C:837:PHE:CD2	2.27	0.69
1:B:127:SER:O	1:B:130:GLU:HG2	1.92	0.69
2:D:827:THR:HG22	2:D:828:ILE:HD12	1.73	0.69
1:A:161:HIS:CB	1:A:166:ILE:HD13	2.23	0.69
1:A:204:LEU:HD21	1:A:217:ILE:HD11	1.75	0.69
1:A:86:ARG:O	2:D:828:ILE:HG23	1.94	0.67
2:D:832:LYS:HB2	2:D:835:GLU:HG3	1.75	0.67
1:B:209:GLU:HG2	3:B:2051:HOH:O	1.94	0.67
1:A:289:PHE:CD1	1:A:301:ILE:CD1	2.79	0.66
1:A:335:LYS:O	1:A:339:GLU:HG3	1.95	0.66
1:A:105:GLY:HA3	1:A:123:VAL:O	1.97	0.65
1:A:237:TRP:CD2	1:A:250:CYS:HB2	2.33	0.64
1:B:155:ARG:CG	1:B:155:ARG:NH1	2.58	0.64
1:B:230:LEU:HD21	1:B:232:ILE:CD1	2.28	0.63
1:B:205:HIS:NE2	1:B:335:LYS:HE3	2.14	0.63
2:D:798:ILE:N	2:D:798:ILE:HD12	2.14	0.62
1:B:354:VAL:HG22	1:B:355:TYR:CE1	2.35	0.62
1:B:126:LYS:HZ3	1:B:161:HIS:HD2	1.47	0.61
1:B:134:VAL:O	1:B:134:VAL:HG12	2.01	0.61
1:B:260:MET:CE	3:B:2082:HOH:O	2.48	0.61
1:B:260:MET:CE	1:B:260:MET:HA	2.27	0.60
1:B:123:VAL:C	1:B:124:LEU:HD12	2.20	0.60
1:A:152:ASN:HD21	1:A:349:ARG:HH21	1.49	0.59
1:A:213:ILE:HD12	1:A:268:GLU:CB	2.33	0.59
1:B:152:ASN:HD21	1:B:349:ARG:HH21	1.49	0.59
1:A:245:ARG:HH12	1:A:266:HIS:CA	2.16	0.59
1:B:122:LYS:HG2	1:B:124:LEU:HD11	1.84	0.58
1:B:253:LEU:HD13	1:B:294:HIS:NE2	2.18	0.58
1:A:152:ASN:O	1:A:232:ILE:CD1	2.51	0.58
1:B:354:VAL:CG2	1:B:355:TYR:CE1	2.87	0.58
1:B:260:MET:HE1	3:B:2082:HOH:O	2.03	0.58
1:A:143:GLU:O	1:A:147:HIS:HD2	1.86	0.57
1:B:124:LEU:CD1	1:B:124:LEU:N	2.66	0.57
1:A:232:ILE:H	1:A:232:ILE:HD12	1.70	0.56
1:A:246:ARG:HD2	1:A:248:TPO:O2P	2.06	0.56
1:B:89:THR:HG22	1:B:91:ASP:H	1.70	0.56
1:B:253:LEU:CD2	1:B:294:HIS:CE1	2.81	0.54
1:B:230:LEU:HD21	1:B:232:ILE:HD11	1.88	0.54
1:A:152:ASN:ND2	1:A:349:ARG:HH21	2.05	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:260:MET:CE	1:B:266:HIS:ND1	2.71	0.54
1:B:183:GLN:HG2	3:B:2038:HOH:O	2.07	0.53
1:B:222:LEU:CD2	1:B:232:ILE:HD12	2.38	0.53
1:B:272:LEU:HD21	1:B:334:LEU:HG	1.90	0.53
1:B:155:ARG:NH2	2:C:822:ASP:OD1	2.40	0.53
1:B:86:ARG:HG2	1:B:87:LYS:N	2.24	0.52
1:A:246:ARG:CD	1:A:248:TPO:O2P	2.57	0.52
1:B:253:LEU:CD2	1:B:294:HIS:NE2	2.72	0.52
1:A:103:LYS:O	1:A:128:GLN:OE1	2.27	0.52
1:B:134:VAL:HG13	1:B:137:GLN:NE2	2.24	0.52
1:B:164:LYS:HB2	3:B:2028:HOH:O	2.08	0.52
1:A:245:ARG:HH12	1:A:265:THR:C	2.13	0.51
1:B:152:ASN:ND2	1:B:349:ARG:HH21	2.08	0.51
1:B:230:LEU:HD21	1:B:232:ILE:HD13	1.92	0.51
1:B:354:VAL:HG22	1:B:355:TYR:CD1	2.45	0.51
1:A:104:PHE:CD2	1:A:129:LEU:HD23	2.47	0.50
1:A:348:ARG:NH2	3:A:2117:HOH:O	2.44	0.50
1:A:211:LYS:CD	1:A:242:PRO:HA	2.30	0.50
1:B:117:PHE:CD1	2:C:819:ILE:HD12	2.47	0.50
1:B:153:ILE:HD12	1:B:235:PHE:HZ	1.76	0.50
1:B:350:VAL:HG13	3:C:2009:HOH:O	2.12	0.50
1:A:227:LYS:CE	3:A:2046:HOH:O	2.60	0.49
1:A:191:GLN:CD	1:A:348:ARG:HG3	2.33	0.49
1:A:232:ILE:N	1:A:232:ILE:HD12	2.27	0.49
1:B:101:LYS:HG3	3:B:2010:HOH:O	2.13	0.48
2:C:819:ILE:HD13	2:C:819:ILE:H	1.78	0.48
1:B:222:LEU:CD2	1:B:232:ILE:CD1	2.92	0.48
1:B:140:ARG:O	1:B:144:ILE:CD1	2.56	0.48
1:B:260:MET:HE3	1:B:266:HIS:ND1	2.28	0.47
1:A:277:VAL:HG13	1:A:288:PRO:HD2	1.96	0.47
1:B:227:LYS:HG3	2:C:815:TYR:CZ	2.49	0.47
1:B:200:LEU:HD12	1:B:232:ILE:HD11	1.97	0.47
1:B:260:MET:HE1	1:B:266:HIS:ND1	2.29	0.47
1:A:237:TRP:CE3	1:A:250:CYS:HB2	2.50	0.47
1:A:104:PHE:HA	1:A:128:GLN:NE2	2.30	0.47
1:A:244:LEU:H	1:A:244:LEU:CD1	2.28	0.46
2:D:819:ILE:HG13	2:D:820:ASP:N	2.29	0.46
2:C:798:ILE:HB	2:C:799:PRO:HD3	1.98	0.46
1:B:327:HIS:CD2	1:B:329:PRO:HD2	2.50	0.46
1:B:354:VAL:HG22	1:B:355:TYR:CZ	2.51	0.46
1:B:354:VAL:CG2	1:B:355:TYR:CZ	2.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:106:ASN:HD22	1:B:106:ASN:HA	1.38	0.46
1:A:248:TPO:C	1:A:249:MET:HA	2.46	0.45
1:B:260:MET:HE1	1:B:266:HIS:HD1	1.81	0.45
1:A:205:HIS:CE1	1:A:335:LYS:HE3	2.52	0.45
1:A:204:LEU:HD11	1:A:217:ILE:HD13	1.99	0.45
1:B:260:MET:CE	1:B:266:HIS:HD1	2.30	0.45
1:A:272:LEU:HD21	1:A:334:LEU:HG	1.98	0.45
1:B:222:LEU:HD22	1:B:232:ILE:CD1	2.46	0.45
1:B:126:LYS:NZ	1:B:161:HIS:CD2	2.77	0.45
1:A:135:GLU:HB3	1:A:139:ARG:HH12	1.82	0.45
1:B:134:VAL:HG13	1:B:137:GLN:HB3	1.99	0.44
1:B:261:ILE:HG12	1:B:298:HIS:NE2	2.32	0.44
1:B:277:VAL:HG13	1:B:288:PRO:HD2	1.99	0.44
1:A:237:TRP:CE3	1:A:250:CYS:CB	3.00	0.44
1:B:89:THR:CG2	1:B:91:ASP:H	2.30	0.44
1:B:261:ILE:HD11	1:B:298:HIS:ND1	2.32	0.44
2:D:806:LEU:H	2:D:806:LEU:HD22	1.83	0.43
1:A:161:HIS:HB2	1:A:166:ILE:HD13	2.00	0.43
1:A:244:LEU:HD13	1:A:244:LEU:H	1.82	0.43
1:B:89:THR:HG22	1:B:91:ASP:N	2.33	0.43
1:A:245:ARG:NH1	1:A:265:THR:C	2.72	0.43
2:D:828:ILE:N	2:D:828:ILE:CD1	2.81	0.43
1:A:245:ARG:NH1	1:A:265:THR:CB	2.83	0.42
1:A:245:ARG:NH1	1:A:265:THR:OG1	2.53	0.42
1:B:261:ILE:HD11	1:B:298:HIS:CE1	2.55	0.42
1:A:114:GLN:HG3	1:A:115:ASN:OD1	2.19	0.42
1:B:222:LEU:HD22	1:B:232:ILE:HD13	2.02	0.42
2:D:828:ILE:N	2:D:828:ILE:HD12	2.35	0.42
1:A:126:LYS:HE2	2:D:836:LEU:O	2.20	0.42
1:A:227:LYS:HE2	3:A:2046:HOH:O	2.19	0.41
1:B:106:ASN:HB3	1:B:108:TYR:CE1	2.55	0.41
2:D:831:PRO:HG2	2:D:836:LEU:HD21	2.02	0.41
1:B:134:VAL:CG1	1:B:137:GLN:HB3	2.49	0.41
1:A:161:HIS:HB3	1:A:166:ILE:CD1	2.43	0.41
2:D:819:ILE:HG13	2:D:820:ASP:H	1.85	0.41
1:A:229:GLU:HG2	1:A:231:LYS:HE2	2.03	0.41
1:B:143:GLU:O	1:B:147:HIS:HD2	2.04	0.41
1:A:211:LYS:HD3	1:A:242:PRO:CA	2.34	0.41
2:C:819:ILE:HD11	2:C:821:VAL:HG12	2.04	0.40
1:B:354:VAL:HG21	1:B:355:TYR:CE1	2.56	0.40
1:A:130:GLU:HG3	1:A:135:GLU:OE2	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:137:GLN:HG2	1:B:141:GLU:OE2	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	268/284 (94%)	258 (96%)	9 (3%)	1 (0%)	34	21
1	B	272/284 (96%)	265 (97%)	7 (3%)	0	100	100
2	C	39/43 (91%)	36 (92%)	2 (5%)	1 (3%)	5	1
2	D	41/43 (95%)	39 (95%)	2 (5%)	0	100	100
All	All	620/654 (95%)	598 (96%)	20 (3%)	2 (0%)	41	27

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	244	LEU
2	C	804	GLY

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	243/255 (95%)	237 (98%)	6 (2%)	47	34

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	248/255 (97%)	235 (95%)	13 (5%)	23	10
2	C	35/38 (92%)	31 (89%)	4 (11%)	5	1
2	D	38/38 (100%)	35 (92%)	3 (8%)	12	4
All	All	564/586 (96%)	538 (95%)	26 (5%)	27	13

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	86	ARG
1	A	94	ASP
1	A	112	GLU
1	A	148	LEU
1	A	192	ARG
1	A	245	ARG
1	B	78	THR
1	B	86	ARG
1	B	89	THR
1	B	106	ASN
1	B	138	LEU
1	B	155	ARG
1	B	163	ARG
1	B	260	MET
1	B	294	HIS
1	B	298	HIS
1	B	353	PRO
1	B	354	VAL
1	B	355	TYR
2	C	806	LEU
2	C	819	ILE
2	C	823	ARG
2	C	829	ASP
2	D	814	GLN
2	D	824	MET
2	D	827	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	106	ASN
1	A	128	GLN

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Mol	Chain	Res	Type
1	A	147	HIS
1	A	150	HIS
1	A	152	ASN
1	B	106	ASN
1	B	137	GLN
1	B	147	HIS
1	B	150	HIS
1	B	152	ASN
1	B	161	HIS
1	B	183	GLN
2	D	809	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
1	TPO	B	248	1	8,10,11	1.90	1 (12%)	10,14,16	3.24	6 (60%)
1	TPO	A	248	1	8,10,11	1.58	2 (25%)	10,14,16	3.47	6 (60%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	TPO	B	248	1	-	2/9/11/13	-
1	TPO	A	248	1	-	2/9/11/13	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	248	TPO	P-OG1	-4.40	1.51	1.59
1	A	248	TPO	P-OG1	-3.17	1.53	1.59
1	A	248	TPO	P-O2P	-2.06	1.46	1.54

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	248	TPO	P-OG1-CB	-5.25	107.35	123.21
1	A	248	TPO	O3P-P-O1P	-5.09	90.76	110.68
1	B	248	TPO	P-OG1-CB	-5.03	108.02	123.21
1	B	248	TPO	O3P-P-O1P	-4.64	92.53	110.68
1	A	248	TPO	O3P-P-OG1	-4.62	85.28	105.99
1	B	248	TPO	O3P-P-OG1	-4.45	86.05	105.99
1	A	248	TPO	O3P-P-O2P	-4.34	91.06	107.64
1	B	248	TPO	O2P-P-O1P	3.90	125.95	110.68
1	A	248	TPO	O2P-P-O1P	3.80	125.57	110.68
1	B	248	TPO	O3P-P-O2P	-3.53	94.13	107.64
1	A	248	TPO	OG1-P-O1P	2.84	120.34	109.39
1	B	248	TPO	OG1-P-O1P	2.57	119.32	109.39

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	248	TPO	CB-OG1-P-O2P
1	B	248	TPO	CB-OG1-P-O1P
1	A	248	TPO	CB-OG1-P-O1P
1	A	248	TPO	CB-OG1-P-O2P

There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	248	TPO	1	0
1	A	248	TPO	5	0

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	B	1
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	248:TPO	C	249:MET	N	2.00
1	B	248:TPO	C	249:MET	N	1.69

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.